(b) **Between Horizontal Crossarms**

The minimum vertical spacings between crossarms supporting supply line conductors and crossarms supporting communication line conductors shall be as follows: (See Plate 1.)

	Supply Circuit Voltage	
	0–7,500	Over 7,500
Vertical Spacings (center to center)	4 feet	6 feet

(c) **Between Line Conductors on Crossarms**

Where line conductors are supported on crossarms spaced as required in (b) above, the minimum vertical clearances between supply and communication line conductor levels shall be as follows at 60° F and no wind: (See Plates 2 and 11.)

Spacing Between Crossarms (Feet)	Clearance Between Conductor Levels (Inches)	
	At the Pole	In the Span
4	40	30
6	60	45

Note: Where necessary, crossarm spacings at the pole shall be increased sufficiently to meet these requirements for clearances in the span.

(d) **Between Conductors on Vertical Racks**

Supply conductors of not over 750 volts may be supported on vertical racks with the following minimum vertical clearances between the conductors: (See Plate 2.)

Span Length	Vertical Clearance Between Conductors
0 to 150 feet	4 inches
150 to 200 feet	6 inches
200 to 250 feet	8 inches
250 to 300 feet	12 inches

(e) **Between Communication Conductors or Equipment and Supply Conductors or Equipment (Except as Covered in (f), (g) and 4(d)1.2 Below)**

The minimum vertical clearance at the pole between such equipment and conductors (with or without guard arms) shall be as follows: (See Plates 2, 3, 7, 8, 11, 14, 15 and 17.)

	Vertical Clearance (Inches) for Supply Voltage Of:		
	0–750	750–7,500	Over 7,500
Supply Cables or Other Equipment and Communication Conductors or Equipment	40	40	60a
Supply Conductors and Communication Cables or Other Equipment	40	48	72

a. This may be reduced to 40 inches for supply cables carried on effectively grounded suspension strands.

Note: For the purpose of measuring these clearances, "equipment" shall be taken to mean non-current-carrying metal parts of equipment, including metal supports for cables or conductors.

Where metal supply crossarm braces are less than 1 inch from transformer cases or hangers which are not effectively grounded, or are attached to metal crossarms, vertical clearances from communication conductors or equipment shall be measured from such braces if they are the lowest attachments in the supply space.

(f) **Between Communication Conductors or Equipment and Span Wires or Brackets**

Span wires or metal parts of brackets (including through bolts) for lamps or trolley contact conductors shall have the following minimum vertical clearances from communication conductors or equipment: (See Plates 4, 5, 6, 7, 11, 12 and 17.)

From Communication Conductors on Crossarms:	
Span Wire or Bracket Above Crossarm	20 inches (a)
Span Wire or Bracket Below Crossarm	2 feet
From Suspension Strands Carrying Communication Cables or Conductors	1 foot
From Longitudinal Runs of Communication Paired Conductors	1 foot
From Communication Cable Terminal, if Practicable	1 foot (b)
From Communication Bridle Wire Rings or Drive Hooks	2 inches

a. This may be reduced to 12 inches for either span wires or metal parts of lamp brackets at points 40 inches or more from the pole surface.
b. In no case shall this clearance be less than 4 inches.

(g) Between Communication Cables and Trolley Feeders

Where suspension strands supporting communication cables or conductors are at a higher level than trolley feeders, the vertical clearance at any point between the bottom of the lowest cable or the lowest conductor and the highest trolley feeder shall be 60 inches where practicable, and in all cases at least 40 inches. (See Plates 11 and 15.)

3. HORIZONTAL SEPARATIONS AT SUPPORTS

The horizontal separation between individual open wire supply line conductors of 0–7,500 volts shall be at least 12 inches, except that for trolley feeders of 750 volts or less and No. 0000 or larger it may be reduced to 6 inches. This separation shall be increased by 0.4 inch for each 1,000 volts in excess of 7,500 volts, and may be measured from the center of the supporting insulator instead of from the conductor itself.

4. VERTICAL RUNS

Cables or conductors run vertically upon a pole shall comply with the following requirements, except where more than 40 inches or 60 inches, as hereinafter specified, above the highest attachment of another utility:

(a) Location

1. Supply and communication vertical runs shall not be made on the same pole where it is practicable to place them on separate poles.
2. Where practicable, supply vertical runs shall be made on the street side and communication vertical runs on the field side of the pole, but in all cases where both are present they shall be on opposite sides of the pole. (See Plate 16.)

(b) Clearances

Vertical runs shall be so arranged as not to interfere with the safe use of the pole steps. They shall be separated from span or guy wires, cable suspension strands, vertical runs, or other metal parts of the equipment of another utility, including through bolts and washers, by one-eighth of the circumference of the pole where practicable, but in all cases by at least 2 inches measured in any direction from the nearest part of the vertical run, including staples or other devices by which the run or its covering is attached to the pole. This clearance may often be secured by means of the eye-bolt method of guy and suspension strand attachment. (See Plates 4, 8, 9, 13, 16 and 17.)

(c) Protection Near Ground

Where within 8 feet from the ground, vertical cables, conductors and supply grounding conductors shall be protected by a covering which gives suitable mechanical protection. For grounding conductors from supply lightning arresters, this covering shall consist of wood molding or other insulating material giving equivalent protection. (See Plates 3 and 10.)

Exception 1—This covering may be omitted for armored cables.
Exception 2—In rural districts, this covering may be omitted for metal sheathed cables, or for grounding conductors having weather-resistant covering.
Exception 3—This covering may be omitted for a grounding conductor which is metallically connected to a conductor which forms a part of an effective grounding system.

(d) Supply Cables or Conductors

1. Installed on the Pole Surface.

1.1 Vertical supply cables or conductors, including trolley feeders, installed on the surface of the pole (or any metal pipe in which such cables or conductors are enclosed) shall be provided with an insulating covering, such as wood molding or fibre conduit, where they pass communication or trolley attachments. This insulating covering shall extend from the lowest point of the vertical cables or conductors up to at least 40 inches above the highest of such attachments. (See Plates 4, 9, 10, 16 and 17.)

Exception 1—This does not apply to vertical supply cables installed in accordance with 1.2 below.
Exception 2—The insulating covering need not extend below the top of the mechanical protection provided for 8 feet above ground.
Exception 3—If the pole has no trolley attachments, insulating covering may be omitted in the case of cables or conductors having an effectively grounded lead sheath or enclosed in effectively grounded continuous metal pipe. Insulating covering may also be omitted in the case of other types of effectively grounded metal sheath cables where mutually agreed upon.

1.2 Secondary supply conductors of not more than 300 volts to ground may be run in multiple conductor cable supported on porcelain cleats or attached directly to the pole surface by means of pipe straps lined with a suitable bushing, or otherwise supported as may be agreed upon to avoid abrasion. In the case of aerial services, the point where such cables leave the pole shall be at least 2 feet above the highest, or 2 feet below the lowest, communication attachment. Each conductor of such cable which is not effectively grounded, shall be insulated as required by 3 below for a potential of at least 1,000 volts. Such cable shall also have a suitable filler and shall be covered by at least one layer of insulating tape and a woven braid or otherwise constructed so as to provide equivalent resistance to abrasion. (See Plate 8.)

2. Not Installed on the Pole Surface.

Vertical supply cables or conductors not installed on the pole surface shall be run in accordance with either 2.1 or 2.2 below.

2.1 On Pins and Insulators.

Supply services of not over 750 volts, and lamp leads of street lighting circuits may be run in paired wire or multiple conductor cable on the street side of the pole on suitable insulators supported on pins or brackets. They shall be held taut at a distance of approximately 5 inches from the surface of the pole and from any pole steps, and shall have a clearance of at least 3 inches from communication cables or conductors. Such conductors of street lighting circuits shall be without splices from the supply space to the luminaire. (See Plates 5, 6 and 16.)

2.2 Suspended From Supply Crossarm.

Lamp leads of street lighting circuits may be run from a supply crossarm directly to a street lamp bracket or luminaire under the following conditions: (See Plate 7.)

2.21 The vertical run shall consist of paired wire or multiple conductor cable, securely attached at both ends to suitable brackets and insulators.

2.22 The vertical run shall be held taut at least 40 inches from the surface of the pole (through the communication space), at least 12 inches beyond the end of any communication crossarm by which it passes, and at least 6 inches from communication drop wires.

2.23 Insulators attached to lamp brackets for supporting the vertical run shall be capable of meeting, in the positions in which they are installed, the same flashover requirements as specified in 7 (b) 1.1 below for luminaire insulation.

2.24 Each conductor of the vertical run shall be No. 10 A.W.G. or larger.

3. Insulation.

Vertical supply cables and conductors, including trolley feeders, shall have a high grade insulation which will effectively retain its insulating properties in service. The insulation shall have a protective covering consisting of at least one weather-resistant cotton braid or its equivalent.

The insulation shall be capable of withstanding the following voltage test after having been immersed in water for 12 hours:

Size of Conductor. A.W.G. or Cir. Mils	Test Voltage, Kilovolts Circuit Voltage* 0 to 600	601 to 1,000	1,001 to 2,000	2,001 to 3,000	3,001 to 4,000	4,001 to 5,000	5,001 to 6,000	6,001 to 7,000
No. 14 to No. 9	3.0	5.0	6.0	9.0	11.0	12.5	14.0	15.0
No. 8 to No. 2	3.5	6.0	7.5	10.0	11.0	12.5	14.0	15.0
No. 1 to No. 0000	4.0	7.5	9.0	10.0	11.0	12.5	14.0	15.0
225,000 to 500,000	5.0	9.0	10.0	11.0	12.5	13.5	15.0	16.0
525,000 to 1,000,000	6.0	10.0	11.0	11.0	12.5	13.5	15.0	16.0
Over 1,000,000	7.0	11.0	11.0	12.5	13.5	15.0	16.0	17.5

*Circuit voltage for constant potential circuits shall be taken as the normal operating voltage. Circuit voltage for series circuits shall be taken as the open circuit voltage, unless devices for limiting the voltage to its normal value or less on open circuit are provided, in which case circuit voltage shall be taken as the normal full load voltage.
Where the circuit voltage is in excess of 7,000, the test voltage shall be increased by 1 kilovolt for each 1,000 volts of the excess.

Exception—These requirements do not apply to grounding conductors, conductors of metal sheathed cables, conductors enclosed in effectively grounded pipes, or conductors installed in accordance with 2.2 above.

(e) Supply Grounding Conductors

1. Nature and Extent of Covering.

Vertical supply grounding conductors shall be covered with wood molding or other suitable insulating material to the extent required for supply cables or conductors in (d) 1.1 above. (See Plates 3 and 16.)

Exception—If there are no trolley attachments on the pole, insulating covering is not required for a grounding conductor which is metallically connected to a conductor which forms a part of an effective grounding system.

(f) Communication Cables

1. Nature and Extent of Covering.

Vertical runs of metal sheathed communication cables shall be covered with wood molding or other suitable insulating material where they pass trolley feeders. This insulating covering shall extend from the lowest point of the vertical cables up to at least 40 inches above the highest such trolley feeders, except that it need not extend below the top of the mechanical protection provided for 8 feet above ground. (See Plate 10.)

(g) Communication Conductors

Vertical and lateral rubber-covered communication conductors may be attached directly to a pole or crossarm. They shall have a vertical clearance of at least 40 inches from any supply conductors (other than vertical runs or street lamp leads) of 7,500 volts or less or 60 inches if more than 7,500 volts.

(h) Communication Grounding Conductors

1. Nature and Extent of Covering.

Vertical communication grounding conductors shall be covered with wood molding or other suitable insulating material between points at least 6 feet below and 40 inches above any trolley feeders by which they pass.

5. COMMUNICATION SUSPENSION STRANDS OR LONGITUDINAL RUNS OF PAIRED CONDUCTORS

Suspension strands carrying communication cables or conductors, or longitudinal runs of paired communication conductors, may be attached directly to the pole or carried on crossarms. Where more than one such strand or paired conductor is present and attached directly to the pole, all shall be on the same side of the pole. They shall where practicable be placed on the field side of the pole, except that in alleys where poles are located close to buildings they may be placed on the alley side. (See Plates 2 and 8.)

Guard arms are not required.

6. CLIMBING SPACE

The following requirements as to climbing space apply only to attachments of one utility when located below attachments of another utility.

(a) Location and Dimensions

A climbing space at least 30 inches square, measured horizontally, shall be provided past any cables, conductors, crossarms, or other attachments. (See Plates 1, 2, 4, 10, 11, 13 and 15.)

Exception—This may be reduced to 16 inches across the line for communication cables or conductors where the only supply conductors at a higher level are secondaries (0–750 volts) supplying signal lights or crossing over the communication line and attached to the pole top or to a pole top extension fixture. (See Plates 17 and 19.)

1. The climbing space need be provided on one side or corner of the pole only.
2. The climbing space shall extend vertically in the same position from a point at least 40 inches below any conductor or other attachment to a point at least 40 inches above such conductor or attachment, but may otherwise be shifted from any side or corner of the pole to any other side or corner.

(b) Portions of Pole in Climbing Space

Portions of the pole when included in one side or corner of the climbing space are not considered to obstruct the climbing space. (See Plate 2.)

(c) Longitudinal Runs

The full width of climbing space shall be provided past longitudinal runs, and shall be measured from the longitudinal run concerned. (See Plates 2, 4 and 13.)

(d) **Vertical Runs**

Vertical runs securely attached to the surface of the pole are not considered to obstruct the climbing space.

7. STREET LAMPS AND STREET LAMP SPAN WIRES

Street lamps or street lamp span wires, where below or less than 40 inches above communication attachments, shall meet the clearance requirements of 2 (f) above and also the following requirements of this section:

(a) **Attachment to Pole**

1. Street lamp span wires shall not encircle the pole, and shall be attached by means of bolts passing through the pole. (See Plate 12.)
2. Lamp brackets and their metal parts shall be confined to the half of the pole circumference nearer the lamp, except that, where the use of lag screws is impracticable, they may be attached by means of bolts passing through the pole. (See Plates 4, 5 and 6.)
3. Scrolls or braces associated with lamp brackets should preferably be reversible so that they may be installed either above or below the horizontal member of the bracket in order to obtain the greatest practicable clearance from communication attachments. (See Plates 6 and 7.)

(b) **Insulation**

1. Luminaire

1.1 The current carrying metal parts of a luminaire (except lamp leads) shall be insulated from non-current carrying metal parts by porcelain or its equivalent. Such insulation, except for installations where the voltage of the circuit in which the lamp is connected does not exceed 300 volts between conductors, shall be of wet process porcelain or its equivalent and, when dry, shall withstand the following voltages without flashover between the live parts and the non-current carrying metal parts.

Full Load Circuit Voltage	Flashover Voltage
300 to 500	5 kv
500 to 1,500	10 kv
Over 1,500	25 kv

Exception—These requirements do not apply to luminaires supported on span wires.

1.2 Luminaires shall be so designed that accumulations of dirt or moisture cannot form a conducting path between the live parts and the non-current carrying metal parts.

1.3 Luminaires having bare metal terminals located outside the housing shall have a separation of at least 40 inches in any direction from communication attachments. Such luminaires shall be so designed as to prevent, as far as practicable, breakdown between the terminals and the non-current carrying metal parts.

1.4 Insulators required by 1.1 above, when used with internally wired units and brackets, shall be designed so that lamp leads may be brought to the lamp terminals without reducing the insulation to ground of such lamp leads.

2. Lamp Leads

2.1 Where lamp leads consist of individual or twisted conductors each conductor shall be insulated in accordance with 4 (d) 3 above. Where lamp leads consist of twin conductor cable, the insulation to ground of the cable assembly shall be the same as required for individual conductors but each individual conductor need only be insulated for 600 volts.

Exception 1—Where the voltage of the circuit to which the lamp is connected does not exceed 300 volts, lamp leads need only be insulated for 600 volts.

Exception 2—Where lamp leads are run directly from a supply crossarm to the lamp in accordance with 4 (d) 2.2 above, there are no specific insulation requirements.

2.2 Lamp leads shall be brought into the luminaire in such a way as to prevent as far as practicable breakdown between conductors and metal parts.

2.3 Where lamp leads are run along a lamp bracket or span wire they shall be supported in such a way as not to injure the insulation. In the case of span wires, insulated rings shall be used between the pole and the strain insulator required by 3 below.

3. Span Wire Insulators

3.1 A strain insulator having a dry flashover at least double, and a wet flashover at least as high as, the voltage of the circuit, in which the lamp is connected, shall be inserted in span wires supporting street lamps. (See Plate 12.)

(c) **Lowering Chains or Ropes**

Lowering ropes for lamps shall preferably be of non-metallic material. However, if metal chains or wire ropes are used, they shall have a separation of at least 3 inches in any direction from communication conductors or equipment, and an insulator shall be installed in such chain or rope so that it will be at least 8 feet above ground when the lamp is in its normal position.

8. TROLLEY SPAN WIRES AND BRACKETS

Span wires or brackets for trolley contact conductors may be attached directly to the pole, provided they conform to the clearance requirements of 2 (f) above and to the following requirements of this section:

(a) **Not to Encircle Pole**

Trolley brackets shall not encircle the pole. They shall be restricted to the half of the pole toward the trolley contact conductor, except that they may be fastened by means of bolts passing through the pole. Trolley span wires shall be attached by means of bolts passing through the pole. (See Plates 11 and 12.)

(b) **Insulation**

A strain insulator shall be inserted in trolley span wires, and in the case of trolley brackets, a strain insulator shall be placed on each side of the trolley contact conductor support. The insulation between trolley contact conductors or feeder taps and poles shall be capable of withstanding, when wet, a voltage equal to at least twice the voltage of the trolley circuit. (See Plates 11 and 12.)

9. GUYS

(a) **Point of Attachment**

Guys should in general be attached to poles as near as practicable to the center of the load to be sustained, except that as far as practicable they should be so located as to avoid reducing the insulation afforded by wood pins, crossarms and poles.

(b) **Clearances**

1. The minimum clearances of guys when crossing over or under cables, conductors or guys of another line shall be as follows:

	Clearance (Feet)
Communication Cables or Conductors	2
Trolley Contact Conductors	4a
Supply Cables	2
Supply Conductors:	
0–750 volts	2
More than 750 volts	4b
Guy, Span and Lightning Protection Wires	2c

a. This clearance should be increased to 6 feet for trolley contact conductors of more than 750 volts, and also for lower voltage contact conductors unless the guy is beyond reach of a trolley pole or is suitably protected against damage from a trolley pole leaving the contact conductor.

b. For voltages greater than 50,000 this clearance shall be increased by 0.5 inch per 1,000 volts of the excess.

c. Completely insulated sections of guys attached to poles carrying no conductor of more than 7,500 volts may have less than this clearance from each other.

2. The minimum clearances in any direction between guys and line conductors or cables attached to the same pole shall be as follows: (See Plate 18.)

	Clearance (Inches)	
	Not Parallel to Line	Parallel to Line
Communication Cables or Conductors	6a	6a
Supply Cables	6	6a
Supply Conductors		
0–750 volts	6	12a
750–7,500 volts	6	12
For each 1,000 volts in excess of 7,500 volts, add	0.4	0.4

a. If Practicable

Note: Guys and suspension strands may be attached to the same strain plates or to the same through bolts.

10. GUY INSULATORS

(a) Electrical Strength

Guy insulators shall be of wet process porcelain or other suitable material. They shall have a dry flashover at least double, and a wet flashover at least as high as the voltage between conductors of the highest voltage circuit to which the guy is exposed. This requirement may be met by installing two or more guy insulators in series instead of a single insulator.

(b) Mechanical Strength

Guy insulators shall have a mechanical strength at least equal to that required of the guys in which they are installed.

(c) Use of Guy Insulators

An insulator shall be located in each guy which is attached to a pole carrying any supply conductors of more than 300 volts to ground. This insulator shall in general be located from 8 to 10 feet above the ground, but where located in the upper end of the guy shall be from 6 to 8 feet from the pole, and in pole-to-building guys shall, if practicable, be located at least 6 feet from the building. (See Plate 18.)

Where a guy is exposed to, or carried over, under or through overhead supply conductors of more than 300 volts to ground, including those on the jointly used poles, and where hazard would otherwise exist, one or more insulators shall be placed so as to isolate the exposed section of the guy as far as practicable. No insulator shall be located less than 8 feet above the ground. (See Plate 18.)

Exception 1—An insulator is not required in stub guys if no part of the guy is less than 8 feet above the ground, or in pole-to-pole head guys if no part is above the communication space and no part is less than 8 feet above the ground.

Exception 2—An insulator is not required if the guy is effectively grounded. Connection to an anchor does not ordinarily of itself constitute effective grounding.

Exception 3—An insulator is not required if the only supply circuits involved do not exceed 550 volts between conductors and do not carry power in excess of 1,600 watts.

Where guys in which it is necessary to install insulators are so arranged that one crosses or is above another, the insulators shall be so placed that in case any guy sags down upon another the insulators will not become ineffective.

11. LINE INSULATORS

(a) Material

Line insulators for use on supply circuits shall be of wet process porcelain, or other material which will give equally good results in respect to mechanical and electrical performance and durability.

(b) Ratio of Flashover to Puncture Voltage

Insulators shall be designed so that their dry flashover voltage is not more than 75 per cent of their puncture voltage at a frequency of 60 cycles per second.

(c) Flashover Voltage

Supply line insulators when tested at a frequency of 60 cycles per second in accordance with American Institute of Electrical Engineers' standards, shall not flashover at voltages less than those in the following table:

Nominal Supply Circuit Voltage	Minimum Dry Test Flashover Voltage
2,300	20,000
4,000	30,000
4,600	32,000
6,600	50,000
11,000	63,000
13,200	69,000
22,000	94,000

(Interpolate for Intermediate Voltages)

The flashover values in the above table are deemed adequate for joint occupancy of poles under all conditions usually met. However, where due to chemical fumes, cement dust or similar cause operating conditions are exceptionally severe, consideration should be given to the use of insulators having dry flashover values in excess of those specified.

(d) **Factory Tests**

Each insulator or part thereof for use on lines operating at voltages in excess of 15,000 volts shall be subjected to a routine dry flashover test at the factory for a period of three minutes at a frequency of 60 cycles per second or to any other test sanctioned by good modern practice.

(e) **Constant Current Circuits**

Insulators for constant current circuits shall be selected on the basis of the nominal full-load voltage.

12. STRENGTH REQUIREMENTS

Note: The requirements of this section do not apply to lines carrying communication cables or conductors and supply secondary conductors or trolley conductors only. Strength requirements for such lines are given in Section 3 of Part 4.

In the calculation of stresses in supporting structures (including poles, guys, crossarms, pins, conductor fastenings and suspension insulators) it is recognized that deformation, deflection or displacement of parts of the structures may in some cases change the loads assumed in these specifications. These effects shall be neglected, however, unless methods for their evaluation are agreed upon by the parties concerned.

(a) **Wood Poles**

1. General

Poles shall be in accordance with the specifications of the American Standards Association.

2. Ultimate Stresses

Different kinds of wood poles shall be considered as having the following ultimate fibre stresses:

Kind of Wood	Ultimate Fibre Stress (Lb per sq in.)
Douglas Fir	7,400
Southern Pine (Creosoted)	7,400
Lodgepole Pine	6,600
Chestnut	6,000
Norway Pine (Red Pine)	5,600
Western Cedar (Western Red Cedar)	5,600
Cypress	4,800
Redwood	4,400
Eastern Cedar (Northern White Cedar)	3,600

3. Allowable Stresses

Unguyed poles shall be of such material and dimensions as to withstand the transverse loading assumed in Section 3 of Part 1 without exceeding their ultimate fibre stress for treated poles or 75 per cent of their ultimate fibre stress for untreated poles.

Unguyed poles shall be replaced, or otherwise suitably strengthened, when they have deteriorated so that they are two-thirds as strong as initially required for treated poles or one-half as strong as initially required for untreated poles.

4. Angles and Dead-Ends

Poles at angles and dead-ends shall where necessary be guyed in accordance with (b) below, or otherwise suitably braced.

5. Minimum Pole Top Diameter

There are no specific requirements for minimum pole top diameters.

(b) **Guys**

Where used to meet the strength requirements for wood poles, guys shall be considered as taking the entire load in the direction in which they act, the poles serving as struts only.

1. Allowable Stresses

Guys shall be of such material and dimensions as will withstand the longitudinal and transverse loading assumed in Section 3 of Part 1 without exceeding the following percentages of their ultimate strength:

	Percentages of Ultimate Strength
Transverse (when new)	75
Longitudinal (at all times):	
In General	No requirement
At Dead-Ends	75

(c) **Crossarms**

1. Minimum Cross-Sectional Dimensions

The minimum cross-sectional dimensions of selected southern pine or Douglas fir supply crossarms shall be as follows:

Number of Pins	Minimum Cross-Sectional Dimensions in Inches
2 or 4	$2^3/_4 \times 3^3/_4$
6 or 8	3×4

2. Bracing

Crossarms shall be securely supported by bracing, if necessary, so as to support safely all loads to which they may be subjected in use, including linemen working on them. Any crossarm except the highest one on the pole shall be capable of supporting a vertical load of 225 pounds at either extremity in addition to the weight of the conductors without ice covering.

(d) **Supply Pins and Conductor Fastenings**

Pins and ties or other line conductor fastenings shall have sufficient strength to withstand an unbalanced tension in the conductor up to a limit of 700 pounds per pin or fastening.

(e) **Supply Line Conductors**

1. Material and Strength

Conductors shall be copper, aluminum cable steel reinforced, copper-covered steel, or other metal which will not corrode excessively under the prevailing conditions, and shall have a size and strength at least equal to that of No. 8 A.W.G. medium-hard drawn copper.

Note: It is recommended that the use of conductors of this minimum size be limited to spans not longer than 150 feet for heavy loading districts and 175 feet for medium and light loading districts.

2. Sags and Tensions

Conductor sags shall be such that, under the loading assumed in Section 3 of Part 1, the tension in the conductor will not exceed 60 per cent of its breaking strength.

(f) **Suspension Strands**

Suspension strands supporting cables or conductors shall be of copper, galvanized steel, copper covered steel or the equivalent, with strengths and sags such that with the cables or conductors in place under the loading assumed in Section 3 of Part 1, they will not be stressed beyond 60 per cent of their ultimate strength.

PART 3—SPECIAL JOINT USE CONSTRUCTION

1. APPLICATION

The requirements of Part 3 shall, in addition to those in Part 1 and Sections 2 to 11 inclusive, of Part 2, apply to all joint use construction involving communication cables or conductors and supply conductors of the following types:

(a) **Supply Conductors**

(Except Normal Joint Use—Section 1 (a) 3 of Part 2)

1. Constant potential alternating current supply circuits normally operating at more than 5,000 volts between conductors or more than 2,900 volts to neutral or ground.
2. Constant current supply circuit of more than 7.5 amperes where the open circuit voltage of the supply transformer is more than 2,900 volts.

Exception—Where agreed by the parties concerned that additional protection is unnecessary, joint lines carrying supply circuits of the types covered in 1 and 2 above and on which the only communication attachments consist of individual paired conductors, may be constructed in accordance with Part 2 of these specifications.

2. STRENGTH REQUIREMENTS

In the calculation of stresses in supporting structures (including poles, guys, crossarms, pins, conductor fastenings and suspension insulators) it is recognized that deformation, deflection or displacement of parts of the structure may in some cases change the loads assumed in these specifications. These effects shall be neglected, however, unless methods for their evaluation are agreed upon by the parties concerned.

(a) **Wood Poles**

1. General

Poles shall be in accordance with the specifications of the American Standards Association.

2. Ultimate Stresses

Different kinds of wood poles shall be considered as having the following ultimate fibre stresses:

Kind of Wood	Ultimate Fibre Stress (Lb per sq in.)
Douglas Fir	7,400
Southern Pine (Creosoted)	7,400
Lodgepole Pine	6,600
Chestnut	6,000
Norway Pine (Red Pine)	5,600
Western Cedar (Western Red Cedar)	5,600
Cypress	4,800
Redwood	4,400
Eastern Cedar (Northern White Cedar)	3,600

3. Allowable Stresses

Poles shall be of such material and dimensions, and so maintained, as to withstand the longitudinal and transverse loadings assumed in Section 3 of Part 1 without exceeding the following percentages of their ultimate fibre stress, or they shall be guyed in accordance with (b) below:

Types of Circuits Carried	Per Cent of Ultimate Fibre Stress: Transverse Loading, When Installed	Transverse Loading, At Replacement	Longitudinal Loading, At All Times
Constant potential between 5,000 and 7,500 volts, or constant currents more than 7.5 amperes where open circuit voltage is between 2,900 and 4,400 volts	60a	100	100
Constant potential more than 7,500 volts, or constant current more than 7.5 amperes where open circuit voltage is more than 4,400 volts	40b	60	100

a. 50 for untreated poles.
b. 33⅓ for untreated poles.

Note: For poles carrying supply circuits of more than one of the above types, the allowable per cent of ultimate fibre stress shall be not greater than the smaller value given in the above table.

4. Angles and Dead-Ends

Poles at angles and dead-ends shall where necessary be guyed in accordance with (b) below, or otherwise suitably braced.

5. Minimum Pole Top Diameter

There are no specific requirements for minimum pole top diameters.

(b) Guys

Where used to meet the strength requirements for wood poles, guys shall be considered as taking the entire load in the direction in which they act, the poles serving as struts only.

1. Allowable Stresses

Guys shall be of such material and dimensions as will withstand the longitudinal and transverse loading assumed in Section 3 of Part 1 without exceeding the following percentages of their ultimate strength:

	Percentages of Ultimate Strength
Transverse (when new)	50
Longitudinal (at all times):	
In General	100
At Dead-Ends	50

(c) Crossarms

1. General

Supply crossarms shall have sufficient strength to withstand any unbalanced longitudinal loads to which they are subjected, with a limit of 700 pounds at the outer pin.

2. Ends of Sections of Joint Use, Corners and Dead-Ends.

At the ends of sections of joint use and at dead-ends, supply crossarms when used shall have sufficient strength to withstand at all times, without exceeding their ultimate strengths, an unbalanced pull equal to the tension in all supported conductors under the loading assumed in Section 3 of Part 1. Where conductor tensions are limited to 2,000 pounds per conductor, double crossarms will be considered as meeting this requirement.

Where the supply line conductors are supported on crossarms, double crossarms shall be used at corners where the angle of departure from a straight line exceeds 20 degrees (17 feet pull).

3. Minimum Cross-Sectional Dimensions.

The minimum cross-sectional dimensions of selected southern pine or Douglas fir supply crossarms shall be as follows:

Number of Pins	Minimum Cross-Sectional Dimensions in Inches
2 or 4	3 × 4
6 or 8	3¼ × 4¼

4. Bracing

Crossarms shall be securely supported by bracing, if necessary, so as to support safely all loads to which they may be subjected in use, including linemen working on them. Any crossarm except the highest one on the pole shall be capable of supporting a vertical load of 225 pounds at either extremity in addition to the weight of the conductors without ice covering.

(d) Supply Pins and Conductor Fastenings

1. General

Pins and ties or other conductor fastenings shall have sufficient strength to withstand an unbalanced tension in the conductor up to a limit of 700 pounds per pin or fastening.

2. Ends of Sections of Joint Use, Corners and Dead-Ends

At the ends of sections of joint use and at dead-ends, pins and ties or other conductor fastenings shall have sufficient strength to withstand at all times, without exceeding their ultimate strengths, an unbalanced pull equal to the tension in the conductor supported under the loading assumed in Section 3 of Part 1. Where conductor tensions are limited to 2,000 pounds per conductor, double pins and ties or other conductor fastenings will be considered as meeting this requirement, except that at dead-ends on pin insulators the conductor tension shall be limited to 1,000 pounds.

Where the line conductors are supported on pin type insulators, double pins and ties or other conductor fastenings shall be used at corners where the angle of departure from a straight line exceeds 20 degrees (17 feet pull).

(e) Supply Line Conductors

1. Material and Strength

Conductors shall be copper, aluminum cable steel reinforced, copper-covered steel, or other metal which will not corrode excessively under the prevailing conditions, and shall have a size and strength at least equal to that of No. 6 A.W.G. medium-hard drawn copper.

Note: It is recommended that the use of conductors of this minimum size be limited to spans not longer than 150 feet for heavy loading districts and 175 feet for medium and light loading districts.

2. Sags and Tensions

Conductor sags shall be such that, under the loading assumed in Section 3 of Part 1, the tension in the conductor will not exceed 50 per cent of its ultimate strength.

PART 4—JOINT USE CONSTRUCTION—SECONDARY OR TROLLEY CIRCUITS

1. APPLICATION

The requirements of Part 4 shall, in addition to those in Part 1 and Sections 2 to 11 inclusive, of Part 2, apply to all joint use construction involving communication cables or conductors and supply cables or conductors of the following types:

(a) Supply Conductors

1. Constant potential alternating current supply circuits normally operating at voltages between 0 and 750 volts between conductors.
2. Direct current trolley circuits of not more than 750 volts to ground.

(b) Supply Neutral Conductors

1. Supply circuit neutral conductors which are effectively grounded throughout their length shall be classified as supply conductors of not more than 750 volts, except that they need not meet any insulation requirements. Other neutral conductors shall be constructed the same as the phase conductors of the supply circuits with which they are associated.

(c) Supply Cables

1. Any supply cables where the voltage between conductors is not more than 750 volts.

2. CLEARANCE BETWEEN SUPPLY SERVICE AND COMMUNICATION DROP WIRES

The clearance, in any direction and at any point in the span, between supply service wires of 750 volts or less and communication drop wires, at 60° F and no wind, shall be at least 1 foot where they do not cross each other and 2 feet at crossings.

3. STRENGTH REQUIREMENTS

(a) Wood Poles

Poles shall be of such initial size and so guyed or braced where necessary as to withstand safely the loads to which they may be subjected, including linemen working on them.

(b) Crossarms

Crossarms shall be securely supported by bracing, if necessary, so as to support safely all loads to which they may be subjected in use, including linemen working on them. Any crossarm except the highest one on the pole shall be capable of supporting a vertical load of 225 pounds at either extremity in addition to the weight of the conductors without ice covering.

(c) Supply Conductors

1. Material and Strength

Conductors shall be copper, aluminum cable steel reinforced, copper-covered steel or other metal which will not corrode excessively under the prevailing conditions, and shall have a size and strength at least equal to that of No. 8 A.W.G. medium-hard drawn copper.

Note: It is recommended that unless the clearances and separations are correspondingly increased, the use of conductors of this minimum size be limited to spans not longer than 150 feet for heavy loading districts and 175 feet for medium and light loading districts.

4. POLE TOP EXTENSION FIXTURES

Fixtures such as those shown on Plate 19, or equivalent types, may be attached to the tops of communication poles to support supply service wires of 750 volts or less crossing over communication lines, provided the following requirements are met. Where fixtures having metal upright members are used, the supply service wires shall be supported on wood crossarms.

(a) Strength

The fixtures shall be of such materials and dimensions, and so erected and maintained, as to withstand without failure the loading assumed in Section 3 of Part 1.

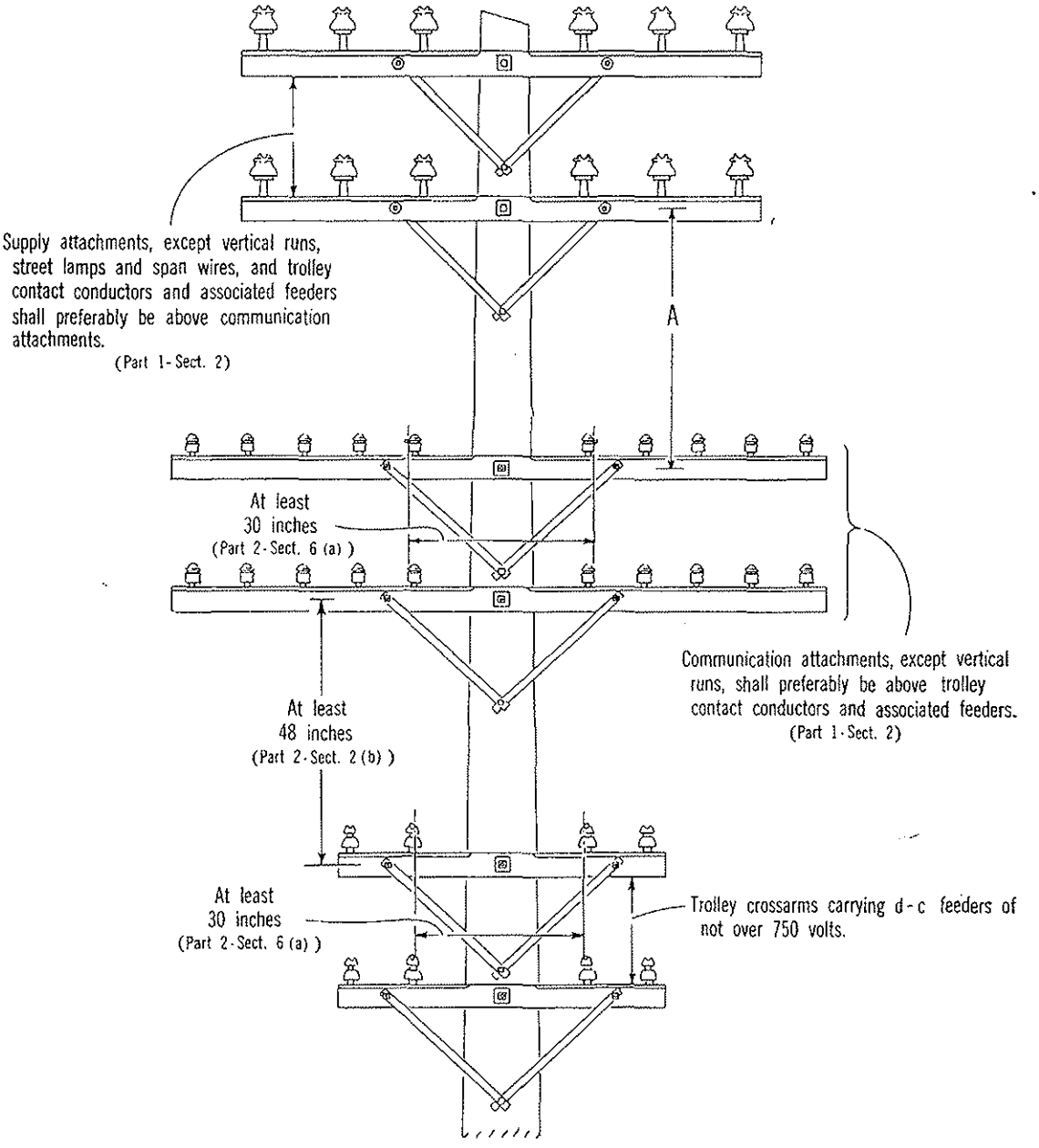
(b) Clearances

A vertical clearance of at least 40 inches shall be provided between the highest communication conductor or other attachment and the lowest metal part of the secondary rack.

A clearance of at least 24 inches, at 60° F and no wind, shall be provided between the lowest service wire and the conductor on the end pin of the highest communication crossarm.

PLATE 1

RELATIVE POSITION OF ATTACHMENTS, SHOWING VERTICAL CLEARANCES AND CLIMBING SPACE

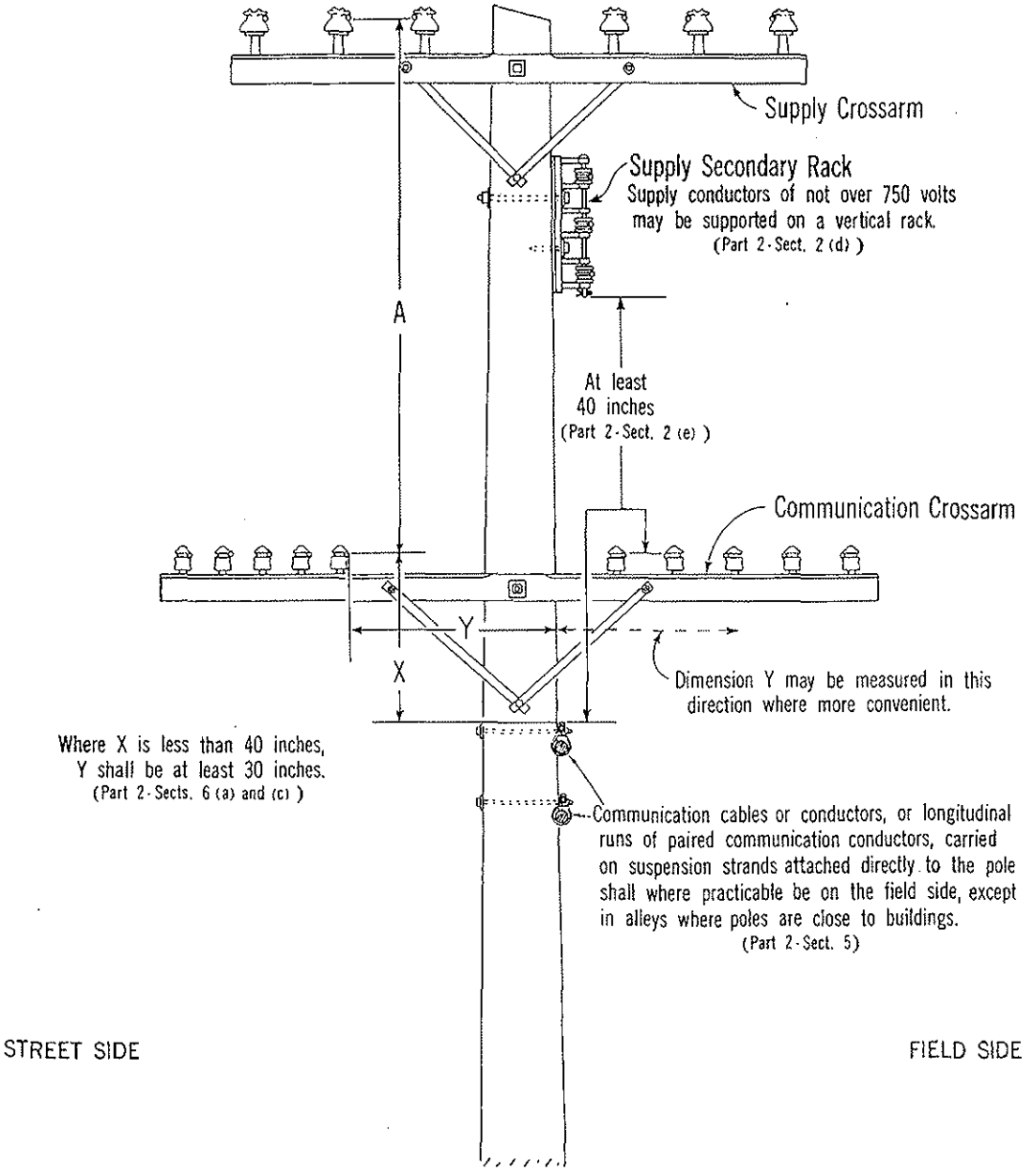


Dimension	Voltage of Supply Circuit Concerned	Minimum Spacing (Inches)
A	0 - 7500	48
	Over 7500	72

(Part 2-Sect. 2 (b))

PLATE 2

SUPPLY SECONDARY RACK AND COMMUNICATION CROSSARM AND CABLES, SHOWING ARRANGEMENT OF ATTACHMENTS, CLEARANCES AND CLIMBING SPACE

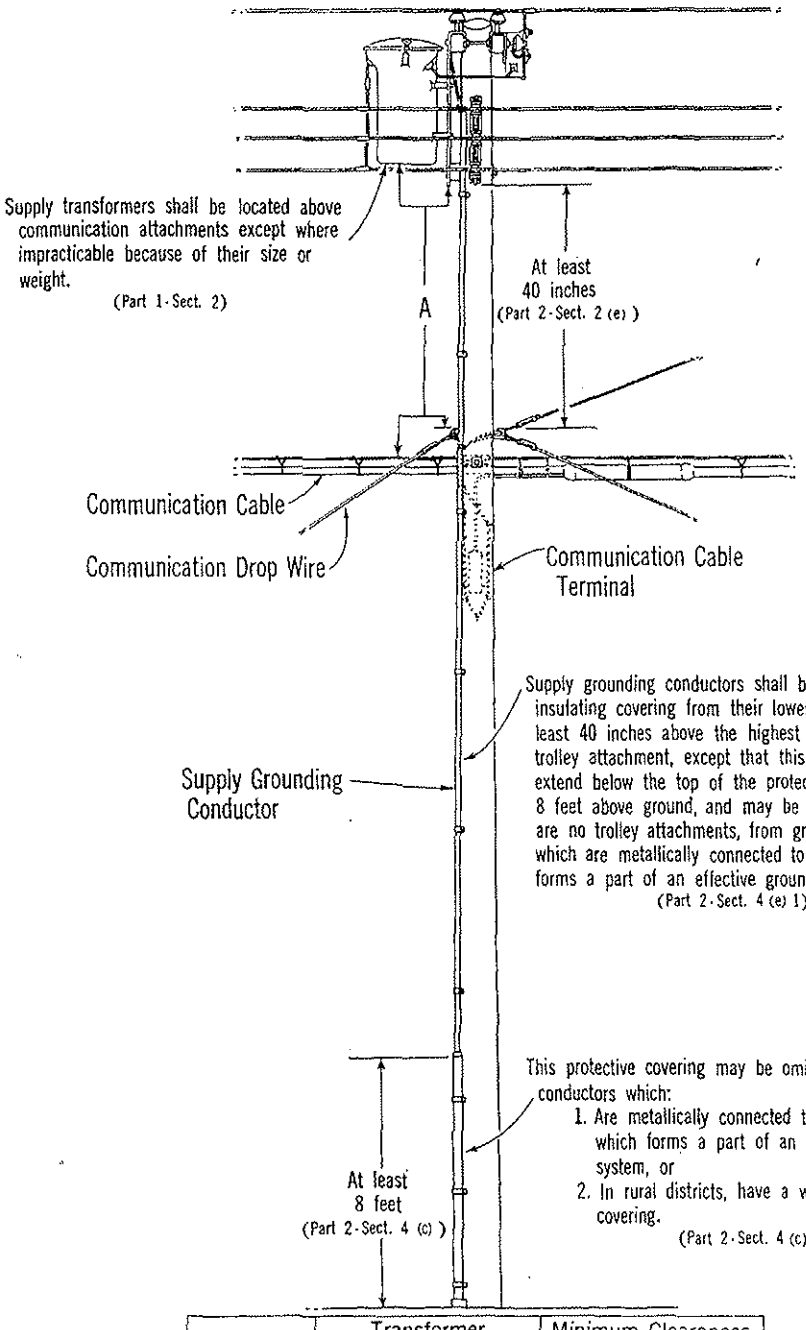


Dimension	Voltages of Supply Circuit Concerned	Minimum Clearances (Inches)
A	0-7500	40
	Over 7500	60

(Part 2-Sect. 2 (c))

PLATE 3

SUPPLY TRANSFORMER INSTALLATION, SHOWING CLEARANCES FROM COMMUNICATION CABLES AND CONDUCTORS



Dimension	Transformer Primary Voltage	Minimum Clearances (Inches)
A	0 - 7500	40
	Over 7500	60

(Part 2-Sect. 2 (e))

PLATE 4

STREET LAMP INSTALLATION, SHOWING USE OF INSULATING CONDUIT OR COVERING FOR VERTICAL RUN

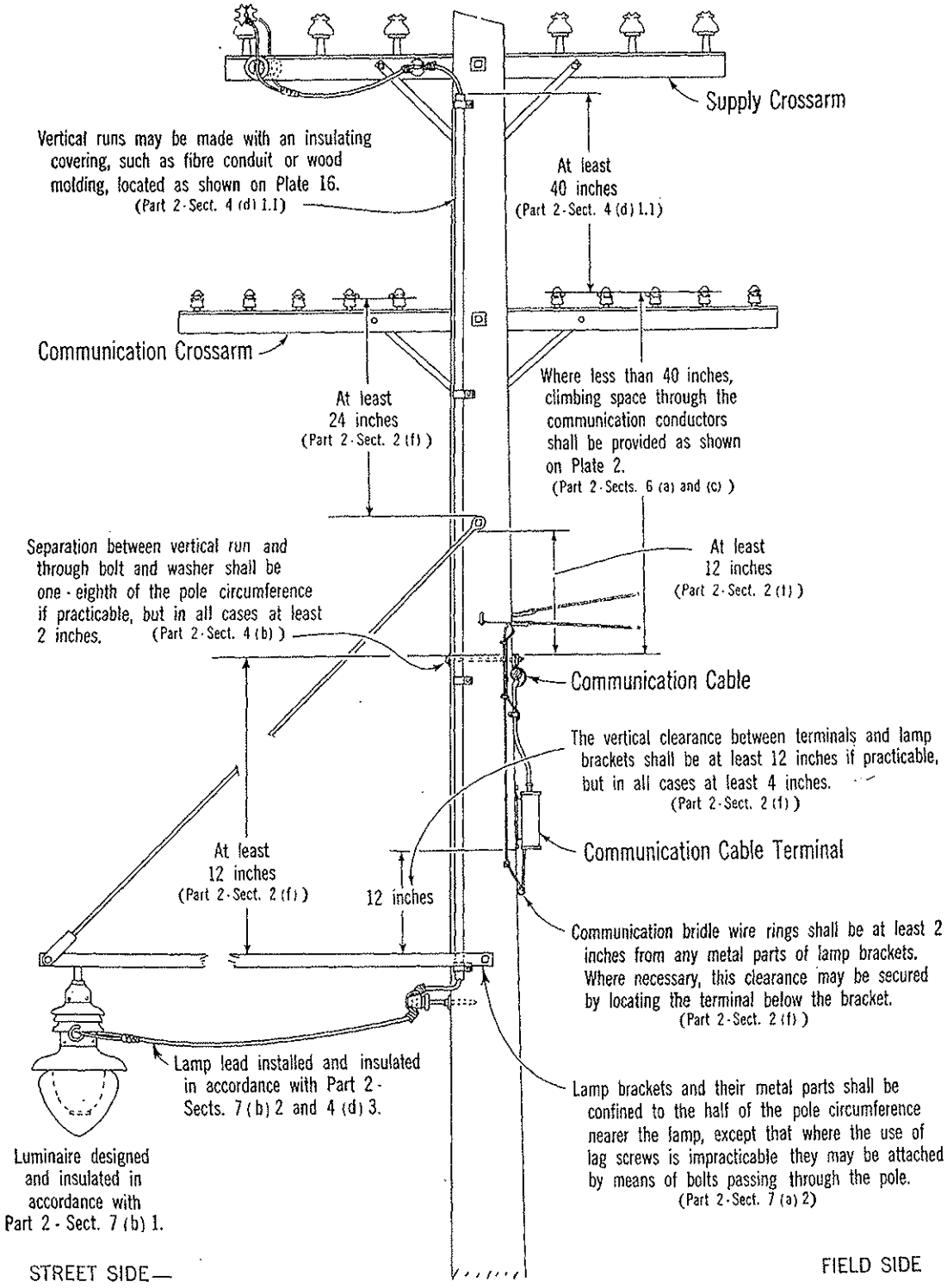


PLATE 5

STREET LAMP INSTALLATION, SHOWING USE OF MULTIPLE CONDUCTOR CABLE ON PINS AND INSULATORS FOR VERTICAL RUN